



ELECTROFUELS

VERSATILE TRANSPORTATION ENERGY SOLUTIONS

PROJECTS:	13	FUNDING YEAR:	2010
TOTAL INVESTMENT:	\$44.5 million	PROGRAM DIRECTOR:	Dr. Eric Toone
PROJECT DETAILS:	arpa-e.energy.gov/ProgramsProjects/Electrofuels.aspx		

PROGRAM

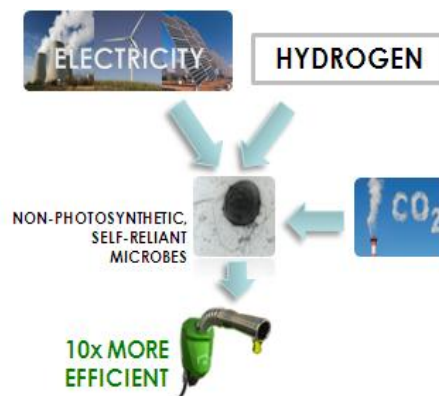
ARPA-E's Electrofuels program is using microorganisms to create liquid transportation fuels in a new and different way that could be up to 10 times more energy efficient than current biofuel production methods. ARPA-E is the only U.S. government agency currently funding research on Electrofuels.

INNOVATION NEED

The U.S. consumes nearly 20 million barrels of oil each day, and nearly half of that oil is imported. Domestic biofuels are one way to reduce our dependence on imported oil and increase our nation's energy security.

Most biofuels are produced from plant material that is created through photosynthesis, a process that converts solar energy into stored chemical energy in plants. However, photosynthesis is an inefficient process, and the energy stored in plant material requires significant processing to produce biofuels. Current biofuel production methods are also intensive and require additional resources, such as water, fertilizer, and large areas of land to grow crops.

Electrofuels bypass photosynthesis altogether by utilizing microorganisms that are self-reliant and don't need solar energy to grow or produce biofuels. These microorganisms can directly use energy from electricity and chemical compounds like hydrogen to produce liquid fuels from carbon dioxide (CO₂). Because these microorganisms can directly use these energy sources, the overall efficiency of the fuel-creation process is higher than current biofuel production methods that rely on the more passive photosynthesis process. Scientists can also genetically modify the microorganisms to further improve the efficiency of energy conversion to liquid fuels. And, because Electrofuels don't use photosynthesis, they don't require the prime agricultural land or water resources of current biofuels.



POTENTIAL IMPACT

If successful, ARPA-E's Electrofuels program would create liquid transportation fuels that are cost competitive with traditional gasoline-based fuels and 10 times more efficient than existing biofuels.

- **SECURITY:** Cost-competitive Electrofuels would help reduce U.S. dependence on imported oil and increase the nation's energy security.
- **ENVIRONMENT:** Widespread use of Electrofuels would help limit greenhouse gas emissions and reduce demands for land, water, and fertilizer traditionally required to produce biofuels.
- **ECONOMY:** A domestic Electrofuels industry could contribute tens of billions of dollars to the nation's economy. Widespread use of Electrofuels could also help stabilize gasoline prices—saving drivers money at the pump.
- **JOBS:** Electrofuels could create jobs in fuel production, distribution, and sales.